

Amendments to the Claims

1. (Cancelled)
2. (New) An apparatus for determining a distribution of particle characteristics by measurement of motion of particles, comprising:
 - a) means for illuminating a plurality of particles, wherein the illuminating means produces a first light beam,
 - b) means for detecting light scattered from said particles, and
 - c) a reflector for directing light from the illuminating means, through a beam splitter, to the detecting means,wherein light from the reflector is combined with light scattered from said particles to produce an interference signal.
3. (New) The apparatus of Claim 2, wherein the reflector is a partial reflector positioned within said first light beam.
4. (New) The apparatus of Claim 3, wherein said partial reflector is in a portion of said first light beam and said partial reflector has a center of curvature at a plane which is conjugate to a light source in said illuminating means producing said first light beam.
5. (New) The apparatus of Claim 2, wherein said partial reflector is in a converging portion of said first light beam and said partial reflector is flat and positioned near to the focus of said converging portion.

6. (New) The apparatus of Claim 2, wherein said reflector is positioned within a second light beam which is reflected by said beam splitter and which does not illuminate said particles.

7. (New) The apparatus of Claim 2, wherein said first light beam is focused through a transparent wall of a container which holds the particles and wherein a focal point of said first light beam is close to said wall.

8. (New) The apparatus of Claim 2, wherein said beam splitter comprises a fiber optic coupler.

9. (New) The apparatus of Claim 8, wherein said reflector is on a surface of a tip of an optical fiber.

10. (New) A plurality of systems, each as described in Claim 2, wherein said systems measure scattered light, scattered from said particles, over various ranges of scattering angles.

11. (New) The apparatus of Claim 2, wherein said first light beam passes through a long volume of fluid to detect low concentration of particles in said fluid, and wherein a flow of said fluid is nearly parallel to said first light beam.

12. (New) The apparatus of Claim 2, wherein intensity fluctuations of the illuminating means are removed from said interference signal by subtraction of amplitude variations from said interference signal.

13. (New) The apparatus of Claim 2, further comprising means for

removing intensity and phase fluctuations of the illuminating means from said interference signal by producing two interference signals with nearly 180 degree phase difference.

14. (New) The apparatus of Claim 13, wherein said beam splitter comprises at least one of a fiber optic coupler and scatter collection optics.

15. (New) The apparatus of Claim 14, wherein said scatter collection optics view a small volume of particles for detecting particle motion.

16. (New) The apparatus of Claim 13, wherein said 180 degree phase difference is maintained by a member of the group consisting of an optical phase shifter and an optical phase modulator.

17. (New) An apparatus for determining a distribution of particle characteristics by measurement of motion of particles, comprising:

- a) means for illuminating a plurality of particles,
- b) means for detecting light scattered from said particles, and
- c) means for directing light from the illuminating means to the detecting means,

wherein light from the directing means is combined with light scattered from said particles to produce an interference signal.

18. (New) A method for correcting a power spectrum of a signal from a scatter detector, to remove a portion, of said power spectrum, which is not caused by scatter from particles of interest, the method comprising:

a) directing a light beam towards a plurality of particles, and detecting light scattered from said particles,

b) defining a first scatter detector signal, as a function of time, with particles in a volume of dispersant which volume is viewed by a scatter detector,

c) defining a first power spectrum of said first scatter detector signal,

d) defining a second scatter detector signal, as a function of time, with nearly no particles in a volume of dispersant which volume is viewed by the scatter detector,

e) defining a second power spectrum of said second scatter detector signal,

f) defining a third signal, as a function of time, from a detector which monitors intensity of said light beam, the third signal being derived while said first scatter detector signal is measured,

g) defining a third power spectrum from said third signal,

h) defining a fourth signal, as a function of time, from a detector which monitors intensity of said light beam, the fourth signal being derived while said second scatter detector signal is measured,

i) defining a fourth power spectrum from said fourth signal,

j) measuring at least one of said first power spectrum, said second power spectrum, said third power spectrum, and said fourth power spectrum,

k) using a measurement from step (j) to calculate a power spectrum of a particle scatter signal by correcting said first power spectrum to produce a corrected power spectrum which represents only a signal due to light scattered from particles of interest, wherein step (k) does not include only subtracting said second power spectrum from said first power spectrum, and

1) calculating a distribution of particle characteristics from said corrected power spectrum.

19. (New) A method for correcting a power spectrum of a signal from a scatter detector, to improve a dynamic range of analog to digital conversion of an interference signal derived from light which is scattered from moving particles, comprising:

a) using a detector to measure an interference signal, from at least one particle, as a function of time,

b) electronically filtering said interference signal to provide a filtered interference signal with a more uniform power spectrum,

c) converting said filtered signal from analog to digital form, to produce a digital sequence of signal values,

d) calculating a power spectrum of said digital sequence,

e) dividing said power spectrum by a power spectral transmission of said electronic filtering to produce a spectral corrected power spectrum,

f) using said spectral corrected power spectrum to calculate characteristics of particles.